

Ph.D. (Computer Science) Entrance Syllabus from Session 2020-21 and onwards
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1. Foundations of Research

2. Problem Identification & Formulation

3. Research Design

4. Qualitative and Quantitative Research

5. Measurement

6. Data Analysis

Part B: Computer Science

1. Discrete Structure

Group: Finite field and error correcting / detecting codes

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2. Computer Arithmetic

Proportional (Boolean Logic), Predicate Logic, Well formed formula (WFF), Satisfactory and tautology

Logic Families: TTL, ECL and C-MOS sates, Boolean algebra and minimization of Boolean functions, Flip-Flop types race conditions and comparison, Design of combinational and sequential circuits

Representation of Integer: Octal, Hex, Decimal and Binary, 2's Complement and 1's complement arithmetic, Floating point representation

3. Programming in C and C++

Programming in C: Element of C-Tokens, Identifiers, Data types in C, Control structure in C, Sequence selection and iteration, Structured data types in C-arrays, structure, union, string an pointers

Object Oriented Programming concepts: Classes, Object, installation, Inheritance, Polymorphism and overloading

C++ Programming: Element of C++ Tokens, identifiers, Variable and constants, Data types, Operator, Control Statement, Function parameter passing, Class and object, Constructor and destructor, overloading inheritance temples, exception handling

4. Relational database design and SQL

E-R Diagram and their transformation to relation design, normalization -1NF, 2NF and BCNF

SQL: Data definition language(DDL) Data manipulation language (DML), Data control language (DCL) commands database objects like. Views, data dictionary

5. Data Structure and Algorithms

Data information ,definition of data structure, arrays, stacks, queues, linked lists, trees, graphs, priority queues, and heaps

Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.

6. Computer Network

Network Fundaments: Local area Network (LAN), metropolitan Area Network *(MKAN), Wide area Network (WAN)m, Wireless Network, Inter Network

Reference Model: The OSI model, TCP/IP model

Data Communication: channel capacity. Transmission media. Twisted pair Coaxial cables, Fiber optic cables, Wireless transmission -radio, microwave infrared and millimeter waves Light wave transmission, telephones-local loop, trunks, multiplexing switching, Internetworking: Switch/Hub. Bridge, router, Gateways.

Network Security: Cryptography-Public key, Secret Key, domain Name System (DNS), electronic mail and worldwide web (WWW).

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7. System Software

Assemble language fundamental (8085 based assembly language programming), Assembler-2pass and single pass, Macros and Microprocessor Loading, linking, program recordable, linkage editing text editor programming environments debugger and program generator

Compilation and interpretation, Bootstrap compiler. Phase of Compilation process, Lexical analysis, Lex package on UNIX System

context free grammar, Parsing and parse trees, representation of parse (derivation) trees as nightmare and leftmost derivation, Bottom up parsers=Shift reduce, operator, precedence, and LR. YACC package on UNIX system

Top down parses-Left recursion and its removal, recursive descend parses. Predictive parses, Intermediate codes, Quadruples, Triples, Intermediate code generation, Code generation, Code optimization

8. Operating System

Main function of operating system, Multiprogramming multiprocessing and multitasking

Memory management: Virtual memory, Paging, fragmentation

Concurrent processing: mutual exclusion, critical regions, locks and unlock

Scheduling: CPU Scheduling, I/o Scheduling, resource scheduling, Banker's Algorithm for deadlock handling

9. Software engineering

System development cycle(SDCL): Steps, water fall model, Prototypes, Spiral model

Software Metrics: Software Project Management

Software Design: System Design, Detailed design, function oriented design, Object oriented design, user interface design, Design level metrics

Coding and Testing: testing level metrics, Software quality and reliability, clean room approach, Software reengineering

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